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AUTHOR Archer, Doug
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ABSTRACT

These materials were designed to be used in inservice training to provide special educators (K-12) with an overview of the microcomputer, including both the terms used to describe it and its capabilities to aid instruction. The preface suggests a sequence for the utilization of the module materials. Then, general background information is presented in the introduction, which focuses on the educational impact of computers, a basic definition of a microcomputer, and five major brands of microcomputers commonly used in education. Basic terms helpful in understanding discussions of microcomputers are also defined, and characteristics of good instructional software are summarized. An outline lists module objectives and audience and format for presentation, while a content outline is provided for a slide tape series and microcomputer disk used in the presentation. Notes on four demonstration disks briefly describe examples of varied microcomputer applications, including games and instructional activities for various content areas, and additional examples are listed. Addresses for three software sources and a list of microcomputer contact persons for 15 area education agencies in Iowa conclude the document. (LMM)

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MICROCOMPUTER

CAI - ASE: AN IN-SERVICE MODULE

Computer

Assisted

Instruction:

Applications

For

Special

Education

Written and Produced by: Doug Archer
Special Education Computer Specialist
Green Valley AEA 14
Creston, Iowa 50801
June 1981

IR010 599

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Introduction

The inservice module described herein was designed and produced to provide special educators with an overview of the microcomputer, including both the terms used to describe it, as well as its capabilities to aid instruction. It's hoped that after reviewing this module that the participant will be on the way to becoming a wise micro consumer.

Needless to say this effort is merely a rudimentary beginning. Used as suggested, the components of the module can lay the ground work for long term utilization and development of microcomputers by special and regular education teachers. What is specifically "special education" about this presentation is the emphasis on basic skills, core curriculum areas, and adaptive hardware for the physically handicapped.

It is suggested that the presenter utilize the materials in a sequence similar to the following:

1) Presenter review all materials, media, and demo disks. Make copies of handouts (or transparencies) if desired for inservice participants. You might want to refer to the script and/or content outline.
2) Peview key terms and definitions with group. If you have a micro, perhaps refer to parts of the unit, as you do so.
3) Show slide/tape series.
4) Review demo disks, noting programs that illustrate examples of micro capabilites listed in the s/t series.
5) Distribute handouts.
6) Begin developing utilization or field test plan for computer assisted instruction for target objectives. Note AEA Resource List, for contact person in your area.

The present module can only touch on the massive changes being wrought by the accelerating saturation of our society by the computer. The microcomputer has made technology available to the masses, unknown in the history of mankind. And because schools refect and prepare people for society, this must impact signifigantly on us as educators. The question is no longer "Will computers be useful for instruction?" nor is it, "Will my students use computers or need to operate computers in thier vocation?" The only question remaining is, "Will you utilize this medium for instruction in your class?" Computers are the literacy that will make or break professions of the 1980's and 1990's, present students and teachers alike.

I urge you to explore how the micro can be useful, to you and your instructional needs. If you have questions, please feel free to contact me at the following address, I would be happy to help you in any way possible.

Doug Archer
Special Ed. Computer Specialist
AEA 14
Creston, Iowa 50801
June 1981

MICROCOMPUTERS FOR SPECIAL EDUCATION: AN INTRODUCTION

Doug Archer
Special Education
Computer Specialist

We live in an electronic age. The beginning of a new era where micro electronics is reshaping our world at an ever increasing rate. Perhaps the greatest characteristic of this revolition is the rapid filtering down of sophisticated electronics to the consumer level. A multitude of electronic toys, appliances, and control devices now make available technology to the average citizen that was unknown even two or three years ago. At the forefront of the movement is the microcomputer. A device not even generally available six years ago. Its growth from a hobby to an electronic toy to a sophisticated information and teaching machine may be the phenomenon of the this century. It now appears that the next ten years will see this innovation permiate every aspect of daily life, heralding what Alvin Toffler has called the "third wave." It is the biggest change in the way we live since the Industrial Revolution. Even now homes are being built and sold where the energy, security, and entertainment systems are managed and provided by microcomputers. The cottage industry of the 1980's is already booming as America's computer enthusiasts become micro programmers and equipment designers of all the required hardware and software that will make the computer do what we want it to. Even now, with the proper equipment, micros can talk, listen, store or retrieve graphics or photographs, serve as an information processing or retrieval system, serve as a prosthetic device, and tutor almost any subject, at any level, to almost any learner.

The invention of the microcomputer has been hailed as the most important technological breakthrough since Guttenburgh invented movable type. Estimates of how many of these units will be in use in the near futre exceed 600,000 with education spending over 200 million dollars for software and 400 million for hardware. It would seem logical, therefore, with that amount of investment and the potential for

instruction already established, that teachers and administrators become wise users and intelligent consumers of this innovation.

For the educator, micros impact on a number of fields all at the same time. Certainly as a job skill, in a number of vacational areas, operational knowledge of computers has become a required basic skill like reading. Computer science itself, is projected to be one of the highest growth vocations in the 1980's. As an instructional and management tool, it can perform many of the repetious, time comsuming clerical tasks in education, freeing up teachers to do more of what only the teacher can do: teach. These function include such management aspects as compiling, delivering, and grading test, as well as, storing and retrieving student data. As a student tutor, computer assisted instruction (CAI) can provide information,provide drill and practice over selected concepts or skills. The micro may hold the potential to truly individualize instruction since it can respond and track student responses without distubing the instructional process.

(BRIDGE)

Perhaps the place to start, is to define what a microcomputer is, so that we can understand what it can and cannot do.

In simple terms the microcomputer is a small, desk top, computer able to perform many functions,formerly limited to large, much more expensive units. Microcomputers are self contained units, which can operate without being connected to another larger computer.

The micro follows the elctronic calculator in the rapid increase of capability and ease of operation while at the same time, decreasing in price. The main difference between the micro and the calculator is that the computer can process or manipulate both text and numbers, while the calculator can only work with numbers. For example, in addition to giving us the formula for finding the radius of a circle, the micro can show us the process, teach us how to use the formula,

give us practice in the application, check our results, and remediate any sub skill involved that we have not yet mastered.

Presently five major microcomputers have emerged as major brands in the United States. Since programming for one is not currently interchangeable with another, the purchase of one is a commitment to the system as well. Many others exist, but these are the most used by educators. They are:

The TRS-80, distributed by Radio Shack, the first consumer microcomputer on the market in 1975 and is probably the largest seller, partially because of the starter unit cost of $500. Currently the TRS-80's strong points are the ease of Programming and its strong software support in business and accounting programs.

The Apple, manufactured by the Apple Computer Company has emerged as the majorcomputer for instruction, primarily because of the large amount of instructional software available in this format. The Apple was the first micro with color and sound.

The PET, manufactured by Commodore Electronics, features a one piece unit, with built in cassette memory, and yellow on black video screen. This unit has neither color or sound.

The Texas Instruments 99/4, distributed by the well known electronics manufacturer, features color and sound with plug in lesson modules, which are actually pre-programmed units. At least two large textbook publishers--McGraw Hill and SRA are in the process of marketing supporting programs in this format. TI has many programs aimed at home utilization.

Atari with two models called personal computers, is the most recent of the American made micros. They feature sound and color, with plug-in modules which combine with programs in the other storage formats, of diskette or cassette tape. Atari has aimed at especially young users. The Atari Model 400, for example, has a sealed, so-called "pop and ice cream" proof, keyboard.

(BRIDGE)

In order to discuss microcomputers, a minimum vocabulary is necessary. Here are a few of the terms usually mentioned in such a duscussion.

To get a computer to work requires a program, often referred to as software. A program is a series of commands, requests for information and other instruction that tell the computer what to do. Programs are most often on cassettes or magnetic disks.

Programs are written in an established computer language of commands understood by that particular computer. Most microcomputer programs are written in a version of the BASIC language. BASIC stands for Beginners All Prupose Symbolic Instruction Code. BASIC enables us to communicate with the computer, in a simple shorthand form of simple commands, such as run, print, load, etc. Each micro has its own version of BASIC, such as TRS Basic, or Applesoft. Programs can be rewritten in different languages, but can't be transferred directly from one computer to another. Thus when selecting a microcomputer, it is wise to consider what programs available in that format or language.

Computers have two types of memory for storing programs. One is user programmable, no permanent and is located in the computer itself. This is called RAM-Random Access Memory. For a computer to use information it must be loaded into RAM, either from a cassette tape or disk. The other memory is permanent and located outside the computer. This type is called ROM for Read Only Memory. ROM refers to the storage of programs on a disk or cassette.

The amount of memory is referred to in terms of the number of characters that can be stored, such as a number. These characters are called bits. A bite is the smallest amount of information that can exist. These numbers are stored in memory in units of eight or sixteen, called Bytes. When discussing the memory of a microcomputer, the capacity is referred to in Bytes, usually in thousands of Bytes. Thousands are usually abbreviated by using the term kilo or K. Thus 16K of RAM,

refers to a Random Access Memory of 16,000 characters;

To show the relative memory capacity, most class room computers, such as the TRS-80, begin with a smaller memory of 16K of RAM, while the cassette tape units used for permanent memory storage (ROM) can hold between 4 - 5K of storage. A diskette can hold in excess of 120K of data.

Most computers have available a number of peripheral of add on devices. These hardware items allow the user to put in or take out a certain type or format of data. Graphics can be placed into the computer a graphics tablet. If you don't want to type, you can mark cards with a pencil, and place data in using a card reader or you can simply write them in pencil on a data pad. Using a printer, both text or graphics can be converted to letter quality print. Even video camera signals can be stored and recalled.

(BRIDGE)

In considering the applications of micros to instruction it is important to separate the technical capabilities of the computer - what it <u>can</u> do electronically, from the operational software that dictates what it does. The most sophisticated equipment will fail to help your students without the appropriately designed software. Likewisw, hardware that can't be adapted to your student's particular mode of learning cannot deliver the information as required. An examination of each area is required.

Most Brands of micros offer the capbilities of high resolution graphics and sound. All can be connected to printers that will print out both graphics and text. All can use ither cassette tape or diskettes. In some cases devices can be connected that either store recorede speech or create it electronically with speech synthisizers. Likewise, visuals can be stored with graphics tablets or video tape or videodisks. Although most of the units have standard keyboards for touch typing, they can be adapted to a variety of inputs.

When reviewing instructional programs, keep in mind the students you would

want to use them with, and where that instruction would be taking place. Will the computer be located in a general student area, such as the library, or will it be in a specific content area such as a classroom. Can the student work independently enough to follow instructions to run a specific program, or should the lesson be self contained both guiding content presentaion and recording results for teacher analysis.

Good instructional software has anumber of characteristics in common, among them:

1) Self Paced Instruction

The text is offered in small, easy to read blocks. Math problems, for example, can come on the screen one at a time, with the student making a response to continue. This feature is especially important when the student runs out of time prior to finishing a lesson. With an escape capability his progress is recorded, and resumed, precisely, when he signs on again, at his next lesson.

2) Takes Advantage of Learning Mode

For visual learners, the micro can illustrate most aspects of problems or use them to remediate concepts. Good graphics are always a part of, rather than an adjunct to, the content of the lesson. Colors can be chosen for high contrast and ease of viewing. Since almost any visual can b can be stored or created, concepts can be dealt with whether real or not. Such a mode may be why one of the most active areas of CAI has been with hearing impaired students.

3) Learner Based Instruction

Instruction is more than jsut a presentation of text, but rather includes remediation of concepts with drill and practice in those areas, all based on student responses. It also demands a minimum of flexibility of presentaion of the program, including size, spacing, and

color of the text. The rate at which information is presented and how many attempts are allowed for a letter or number response. The keyboard can be bypassed entirely with an electric pencil or touch sensitive screen. Vo Voice inputs can also be used. Such modifications have proven a tremendous aide for physically handicapped individuals, not only in instruction, but for communication and environment of control as well. In some cases it has become a means of employment. For them the micro is an electric extension of themselves.

4) Teacher Assignable

A growing number of CAI programs are actually self containded curriculums for selected skill areas, grade levels, or content area. These include the ability to make and deliver student instructional assignments, remediate skill deficits, and store the results for later teacher analysis.

5) No Knowledge of Programming is Neccessary

Almost all commercially available programs are designed with the idea that the user will be a student or teacher and not a computer programmer. Most prompt the user for all information required and place the responses in the proper format. Just as you can reap all the benfits from the modern automobile without being a mechanic, you can use a microcomputer to achieve complex instructional objectives with almost kno knowledge of its inner workings.

6) Teacher Management

Since so much of special education has to do with documentation and prescriptive materials retrieval, and since so much of the data is duplicated in multiple files, the data processing capabilities of the micro would seem make for the special education teacher. Much can be seen in examining a program designed to facilitate the development of an individualized education plan, entitled Programming for Individualized Education or

PIE program. Not only are all steps of the staffing process tracked and s stored but also diagnostic test scores matched with appropriate instructional objectives and material. In effect the IEP can be created and stored electronically, with losts of room for observational data. This fact means it is always current and can be printed out, whenever documentaion is required. As these types of systems are perfected, the integration of diagnostic evaluations with prescriptive retireval will greatly accelerate the ability of the teacher to individualize instruction for each student. Updating and rewriting IEP's wil also be greatly facilitated.

As you can see the instructional possibilities of microcomputers have only begun to be developed. Perhaps the mosth exciting aspect of this subject is that the future will only get brighter. If you have seen some possibilities that interest you, the next step would be to prioritize the instructional needs you have, then look at micros and their software with those goals in mind. The potential is there. Whether you elect to make use of this technology or ignore,it is up to you.

(MUSIC)

CAI - ASE

OBJECTIVE(S):

By the end of the module, participants

1. can name three applications of micros in their given classroom or instructional setting.

2. can name two types of memory used by the microcomputer

3. can name three resources for micro software in Iowa and (at least) one in their area.

4. can name three major brands of microcomputers, with special features of each.

5. are better able to make an informed decision regarding applications and/or purchase of a micro for their classroom needs.

AUDIENCE:

1. K-12 special education teachers, administrators

2. AEA staff -- all disciplines

FORMAT:

1. Sampler diskette -- with script/resources for presenter.

2. Slide/tape series -- with automatic and manually pulsed sound track.

3. All of above based on Content Outline (attached)

CONTENT OUTLINE

1. Slide-Tape Series

A. Introduction
   1. Brief History of Micros
      a. First one marketed 1975
      b. Grown from hobby to school use
   2. Current Models - most popular
      a. TRS-80
      b. PET
      c. Apple
   3. Definitions
      a. Microcomputer
      b. Micro processor
      c. Common terms for Micro
         (1) Byte
         (2) Memory/storage systems
         (3) ROM
         (4) RAM
         (5) CAI/CMI/CBE
         (6) Languages
            (a) Basic
            (b) Derivations of Basic
            (c) Others

B. Capabilities
   1. Technical
      a. Color
      b. Sound
         (1) Input
         (2) Output
      c. Graphics
         (1) Input
         (2) Output
   2. Instructional
      a. Self-paced
      b. Takes advantage of learning mode
         (1) Visual
            (a) Non-readers
            (b) Deaf
         (2) Auditory
            (a) Blind
            (b) Braille inputs
      c. Programming allowances
         (1) Remedial branching
         (2) Felxibility of format
            (a) Size of print
            (b) Rate of presentation
            (c) Number of trys
         (3) Dynamic keyboard
         (4) Little/no typing
         (5) Self scoring
         (6) Teacher assignable
         (7) No programming knowledge necessary
      d. Examples of uses for instruction from research articles
      e. Examples of software that illustrate uses.

CONTENT OUTLINE (continued)

II. Demo Disk

A. Applications
   1. Drill and Practice
      a. Rote Memorization
      b. Multiple levels/multiple trials
      c. Reinforces with visuals
   2. Learner Based
      a. His level
      b. His pace
   3. Simulations
      a. Given conditions
      b. Variable outcomes
      c. Based on student choices
      d. A form of D & P
   4. Entire curriculum on disk
      a. Self contained
         (1) Pretest
         (2) Post test
         (3) Individual assignments
         (4) Remedial tracks
      b. Cost/effectiveness may be less that comparable textbooks
      c. Makes teacher manager of instruction
      d. Can tie into other material/methods

B. Operation
   1. Naming hardware
   2. Connecting hardware
   3. Powering up
   4. Loading programs

C. Other
   1. Handouts
      a. Reprints of pertinent articles
      b. Dictionary of micro terms
      c. Price lists of equipment
      d. Comparison of different micros
   2. Sources
      a. Software
      b. Hardware
      c. Funding

NOTES ON DEMO DISKS

These diskettes contain a sampling of programs showing various CAI methods, in several content areas. Some are very simple; others, more complex. The selection was limited by copyright laws.

TO LOAD: boot disk- usually by turning power on, or typing "PR# 6".

TO CHANGE PROGRAMS: hit reset and type "Run Hello".

Sources for programs are listed. For others contact:

Doug Archer
Special Education Computer Specialist
Green Valley AEA 14
Green Valley Road
Creston, IA 50801
(515) 782-8443

DEMO DISK I

Hurkle (MECC)

A math game that hides graphic character (Hurkle on a number line as grid.)

Math Game (MECC)

A math drill for 1 or more participants, in the areas of addition, subtraction, multiplication and division. Problems vary with age and choice of degree of difficulty.

Spelling (AEA 14 modified)

This provides two spelling drills, containing 2 lessons from the Cedar Rapids Spelling Program. Student is shown word then word is erased with student asked to type correct spelling. Running grade of performance is displayed with option to exit at any point.

Flash Spelling (AEA 14 modified)

Similar to Spelling, only uses large letters, which limits words to eight letters or less. Fewer options for user.

Pour (MECC)

Math tutorial on volume measurement. Note how graphics illustrate student choices, right or wrong.

Add w/ Carry (AEA 14 modified)

An addition drill prompting users for input at each step of the process. Only right answers allow student to continue.

Fred Fraction (KydeTyme Math)

An example of a math drill developed using the KydeTyme authoring system(San Juan, Unified School District, Sacramento, CA.) Note use of graphics, animation and sound.

DEMO DISK II

Test Taker (CBITS Test)

A test generator that generates tests either from a specific set of questions or randomly(6 questions on concept and 2 for example). The student can take the test on computer or the test can be printed out. This sample shows the four types of questions that can be used: multiple choice, matching, true-false, and fill in the blank. When taken on the computer, scores are stored by student name. Student responces for each question are also stored for item analysis. The two disk set also includes graphics generator for 2 types of items. When asked for test type "2".

Odell Lake (MECC)

A discovery learning simulation game, where player becomes a fish at Odell Lake and learns what fish do eat, chase, or run from. Note how graphics illustrate outcomes.

Worder (MECC)

A teacher utility which takes words you type in, then generates a word find. The full version prints out hard copy versions.

DEMO DISK III

Verbs (Shrine School)

A drill on verb usage is/are or was/were. Given shoice of number of senteces.

Adjectives (Shrine School)

Same as Verbs, except for adjectives.

Baseball (Shrine School)

Two teams answer math problems, results are translated to performance in a baseball game.

Alphabet (Shrine School)

A section of the alphabet is displayed, with a blank space. The user is to fill in the missing letter.

DEMO DISK IV

Oregon (MECC)

A simulation game where the player is trying to cross the continent to Oregon in 1840.

Supermath (AEA 14)

A low resolution graphic, math drill, generates large numbers for drills on addition, subtraction, division, and multiplication.

Furs (MECC)

A simulation game where player is fur trapper in Louisianna Purchase in early 1800's.

EXTRA EXAMPLES IN MATH AND LANGUAGE ARTS:

AEA 14 Math Pak

Horses - A number of horses are shown and player msut guess appropriate numeral.

Basic Math - A symbolic math drill using boxes in addition to numerals.

Color Math Dice - Graphic dice are used instead of numerals for math drill.

Long Division - A problem solving program which illustrates each step in long division.

Math Tutor - A two part program that both tests learner level and provides drill.

Number Pattern - Displays numbers one at a time, your task; to remember sequence and repeat.

Digits - Player hits game paddle up to nine times, screen displays appropriate numeral.

Dog Fight - Translates performance on long division drills to shooting down opponents airplanes.

MusicMath - Math drill with appropriate musical tones for student responces.

MECC Prefix Drill - This disk contains a number of tutorial lessons on prefixes. Users lots of graphics, sound and animation.

SOURCE LIST FOR SOFTWARE:

MECC
Minnesota Educational Computer Consortium
2520 Broadway Drive
St. Paul, MN 55113

Educational Courseware Corporation
405 Jones Avenue
Maquoketa, IA 52060

Shrine School
4259 Forrest View
Memphis, TN 38118
Attn. Monte Burns

MICROCOMPUTER CONTACT PEOPLE BY AREA EDUCATION AGENCY

Clem Steel
Area Education Agency 1
Rt. Box 330A
Elkader, Iowa 52043 — 319-245-1480

Dan Rohner
Area Education Agency 2
P.O. Box M — 800-392-6640
Mason City, Iowa 50428 — 515-357-6125

Gaylen Roskens
Area Education Agency 3
Cylinder, Iowa 50528 — 712-424-3868

and

Area Education Agency 4
102 S. Main Ave.
Sioux Center, Iowa 51250 — 712-722-4376

Bill Ashby
Area Education Agency 5
P.O. Box 1399
Ft. Dodge, Iowa 50501 — 515-576-7434

John Cook
Area Education Agency 6
9 Westwood Dr.
Marshalltown, Iowa 50158 — 515-752-1578

Joe Hohlfeld
Area Education Agency 7
3712 Cedar Heights Dr.
Cedar Falls, Iowa 50613 — 319-277-3330

Bruce Pogue
Area Education Agency 9
2604 West Locust St.
Davenport, Iowa 52804 — 319-391-0409

Joe Rayer
Area Education Agency 10
4401 Sixth St. SW
Cedar Rapids, Iowa 52504 319-399-6711

Barry Pitsch
Area Education Agency 11
1932 SW 3rd
Ankeny, Iowa 50021 515-964-2250

Jim Mc Donald
Area Education Agency 12
1520 Morningside Ave.
Sioux City, Iowa 51106 712-279-6619

Bruce Holmquist
Area Education Agency 13
Box 1109
Council Bluffs, Iowa 51502 712-366-0503

Doug Archer
Area Education Agency 14
Green Valley Rd.
Creston, Iowa 50801 515-782-8443

Area Education Agency 15
Blg.#40
Ottumwa Industrial Airport
Ottumwa, Iowa 52501 515-682-8591

Area Education Agency 16
365 Ave. F
Ft. Madison, Iowa 52627 319-372-4821